

## Single hearth LPG fuel gas stoves using mechanical fire lighter systems





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## One-burner LPG stove with mechanical ignition system

### 1. Scope

This standard defines the general construction, dimension, and testing method of one-furnace LPG appliances independent of the LPG cylinder, and for household use only.

### 2 Normative Reference

BS EN 484:1998, *Dedicated liquefied petroleum gas appliances*.

### 3. Terms and Definition

#### 3.1

##### **one-furnace gas appliance**

gas appliance having single cooking grid

#### 3.2

##### **mechanical ignition system**

a fire ignition working on mechanical basis

#### 3.3

##### **burner**

the source of fire

#### 3.4

##### **burner stand**

a place on which a burner is positioned

#### 3.5

##### **gas valve**

a device to control the gas flow from the burner

#### 3.6

##### **grid**

a device to support the cooking devices

#### 3.7

##### **back-fire**

fire entering the burner chamber or burner stand



**3.8**

fire that does not attach/fly from the burner hole

**3.9****heat consumption**

LPG fuel consumption required to ignite the stove

**4. Quality Requirements****4.1 Material**

**4.1.1** The material used for construction and effective shall not change when in use. The appliance does not visually dented, bouncing, and the fire remains blue, after being tested according to item 5.2, 5.3, 5.4 dan 5.1.4. 5.1.5, 5.1.6.

**4.1.2** Gasket, seal, partition or heat insulating material shall not be made from asbes

**4.1.3** The stove body made from non corrosive-proof material shall be coated by corrosive-proof layer, tested according to item 5.6.

Material used is made from good corrosive-proof material, such as brass or stainless steel. Or at least coated by corrosive-proof layer, such as chrome, plating zinc, or other.

**4.1.4** The material and coating on the grid is fire resistance, tested according to item 5.5.2

**4.2 Stability**

The appliance with a vessel on it shall not be easily overturned or shifted, according to item 5.3

**4.3 Strength**

**4.3.1** Constructionly, the product unit shall have strength in supporting the load when being used, not causing fracture/crack or permanent deflection, tested according to item 5.4

**4.3.2** Constructionly, the product unit shall not experienced change when shifted, shaken, and other thing that can disturb the product function and cause leak, tested according to item 5.7



#### 4.4 Ease of maintenance

**4.4.1** The appliance components shall be easy to clean, tested according to item 5.5.3

**4.4.2** The angle part or side of the components shall not be harmful which can cause injury when cleaning the product unit. Testing according to item 5.5.4

#### 4.5 Security

**4.5.1** The appliance component shall not be leaky, testing according to item 5.8

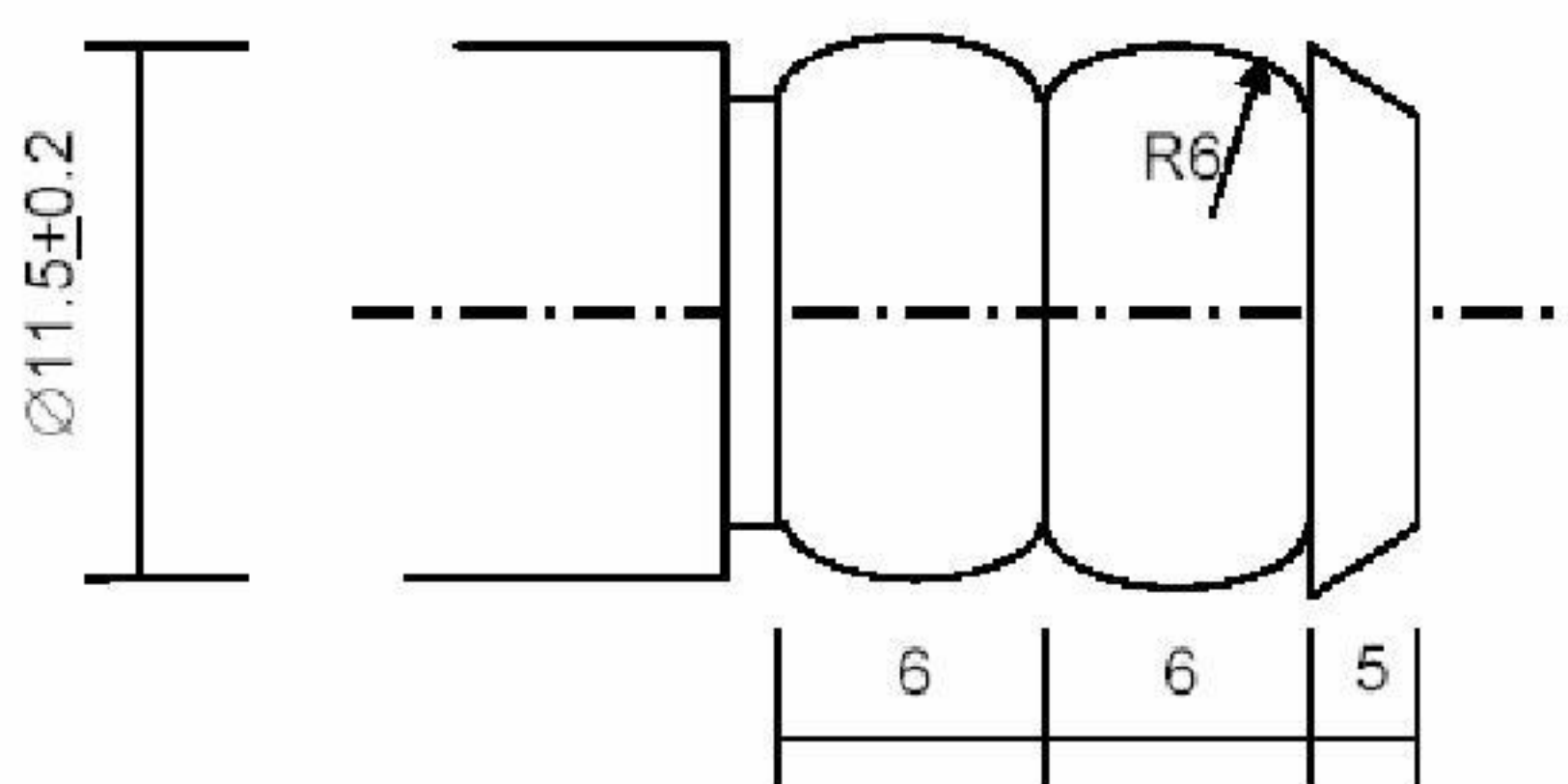
**4.5.2** Burner shall be well designed or placed so as to avoid the possibility of clogging of fire hole at the burner. Testing according to item 5.1.6

**4.5.3** Part of appliance that has potential of being touched by hand, its temperature shall not exceed 80 °C. Testing according to item 5.2.

**4.5.4** The appliance shall be able to work at the pressure of minimum 200 mm H<sub>2</sub>O and maximum 330 mm H<sub>2</sub>O

#### 4.6 Components Connections

Profile of gas entry hose to the appliance (gas pipe) is according to the following :



**Figure 1** Profile of gas entry hose to the appliance (gas pipe)

#### 4.7 Gas Valve

**4.7.1** Grease used shall be able to avoid gas leak other than as valve grease, testing according to item 5.8 and comply to 4.7.2

**4.7.2** The ignition system and gas valve shall be able to show the same performance

**4.7.3** The rotation to open the gas valve is anticlockwise and it has maximum and minimum gas opening indication. The ignition shall be integrated to the gas valve and



work at the same time to switch on the fire when the valve is opened. Testing according to item 5.5.5

**4.7.4** At the maximum, the flame quality remains with minimum efficiency of 50%, testing according to 5.1.5

**4.7.5** At minimum position, the flame shall not be off, testing according to 5.1.2 and 5.1.3

## **4.8 Burner**

**4.8.1** Burner material shall be resistant to heat and shall not change its shape, after going through test 5.1.4 it shall comply to item 5.5.5

**4.8.2** When used, burner and burner stand shall not produce odour or hazardous condition, burner can be coated by flameproof material, testing according to item 5.5.3

**4.8.3** the colour of the flame shall not change to red when used that may cause the decrease of fuel efficiency, testing according to item 5.5.3

**4.8.4** Of the condition of the flame, it shall not occur that the flame is lifted up or the flame bounces back into the product unit, testing according to item 5.1.1 and 5.1.8

## **5. Testing Method**

The sampling is done on 1 per 1000 production unit

### **5.1 Flame Test**

**5.1.1** At the maximum position, turn on the appliance for 5 minutes. Turn off suddenly, there shall not be any bounced back flame larger than 70 dB (measured at 1 m distance with 30° from horizontal, using sound meter.

**5.1.2** At the minimum opening of the valve/smallest flame, the flame shall not be extinguished.

**5.1.3** At the minimum flame, the flame shall not be extinguished when the wind blows at the speed of 3 m/s.

**5.1.4** The measurement of heat consumption is done as follows :

- a) Switch on the appliance for 1 hour
- b) Calculate the LPG consumption during the time by subtracting the end mass from the initial mass of the LPG tube, to get the flow rate of the appliance (in kg/hour)



c) The product heat consumption is calculated by the following formula (BS EN 484:1998)

with:

$$Q_n = \frac{1000 \times M_n \times H_s}{3600}$$

Q<sub>n</sub> is heat consumption (kW);

M<sub>n</sub> is the gas flow rate (kg/jam);

H<sub>s</sub> is the gas calory value = 49,14 MJ/kg;

The product heat consumption may have tolerance of 10%.

**5.1.5** The measurement of efficiency is done as follows :

- Testing is done with pressure input at 280 mm H<sub>2</sub>O;
- Do the initial heating by heating up a Ø 200 mm flask containing 3.7 kg water for 10 minutes
- Heat up flasks containing water having dimension according to Table 1, and measure the efficiency using the following formula (BS EN 484:1998) :

$$\eta = \frac{4.186 \times 10^{-3} \times M_e \times (t - t_1) \times 100}{(M_c \times H_s)}$$

Where : M<sub>e</sub> = M<sub>e1</sub> + M<sub>e2</sub>

With

M<sub>e1</sub> is the mass of the water in the flask, kg;

M<sub>e2</sub> is the mass of the aluminium flask + stopper, kg;

t is the final temperature, taken as the highest point measured after the flame is extinguished (when the temperature of the water reaches 90 °C ± 1°C);

t<sub>1</sub> is the initial temperature = 20 °C ± 0,5 °C;

M<sub>c</sub> is the mass of the gas burnt, measured from the start to the end of the testing (from t<sub>1</sub> to t) in kg



Tabel 1 Determination of flask  $\varnothing$  and mass of waterHeat Consumption , kW  $\varnothing$  flask, mm Mass of water, Me1, kg

Asupan Panas , kW	$\varnothing$ bejana, mm	Massa Massa air, Me1, kg
1,16 ~ 1,64	220	3,7
1,65 ~ 1,98	240	4,8
1,99 ~ 4,2	260	6,1

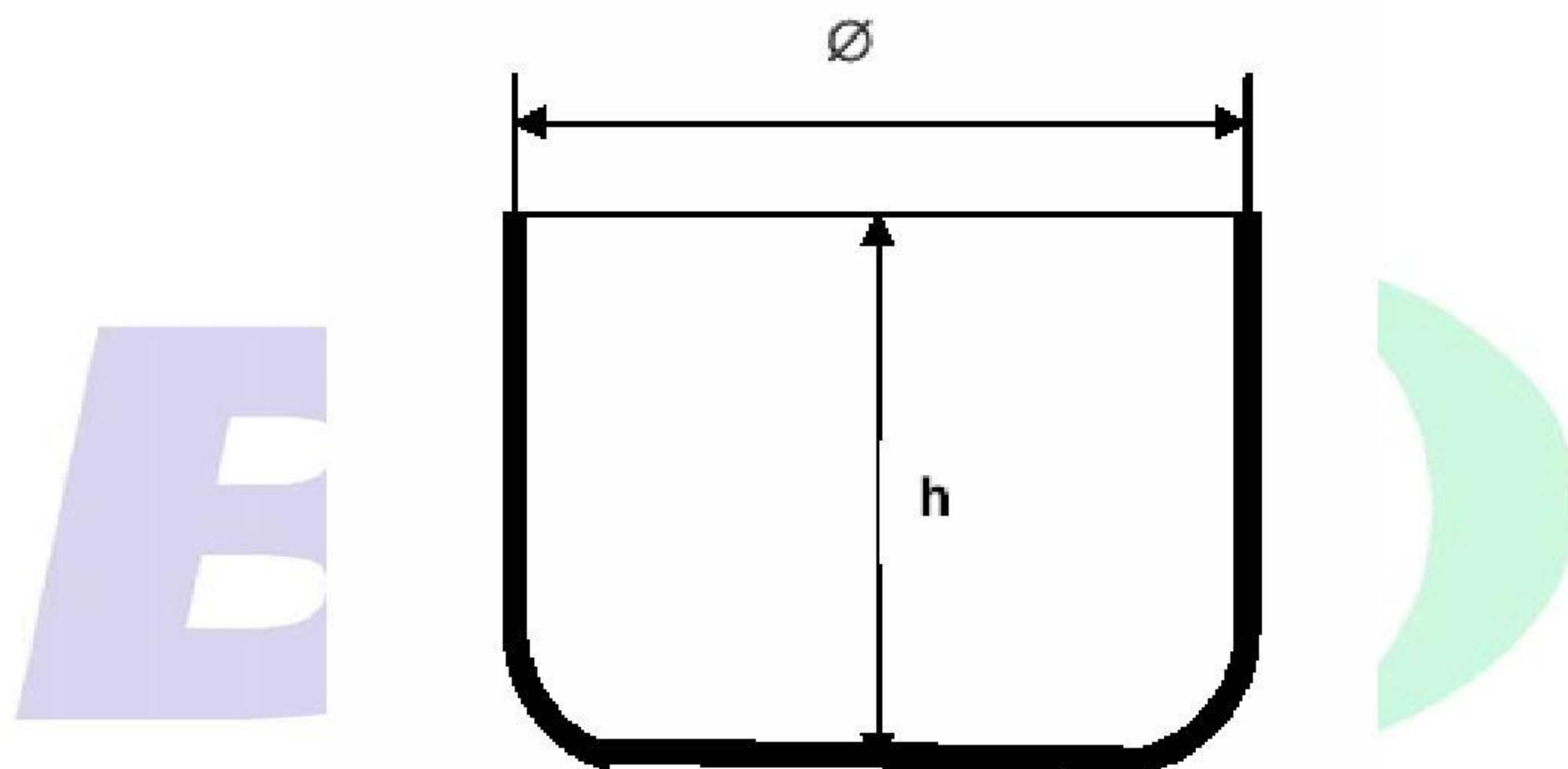


Figure 2 Aluminium Flask

Table 2 Dimension of alumunium, thickness of 0.5 mm  $\pm$  0,1 mm

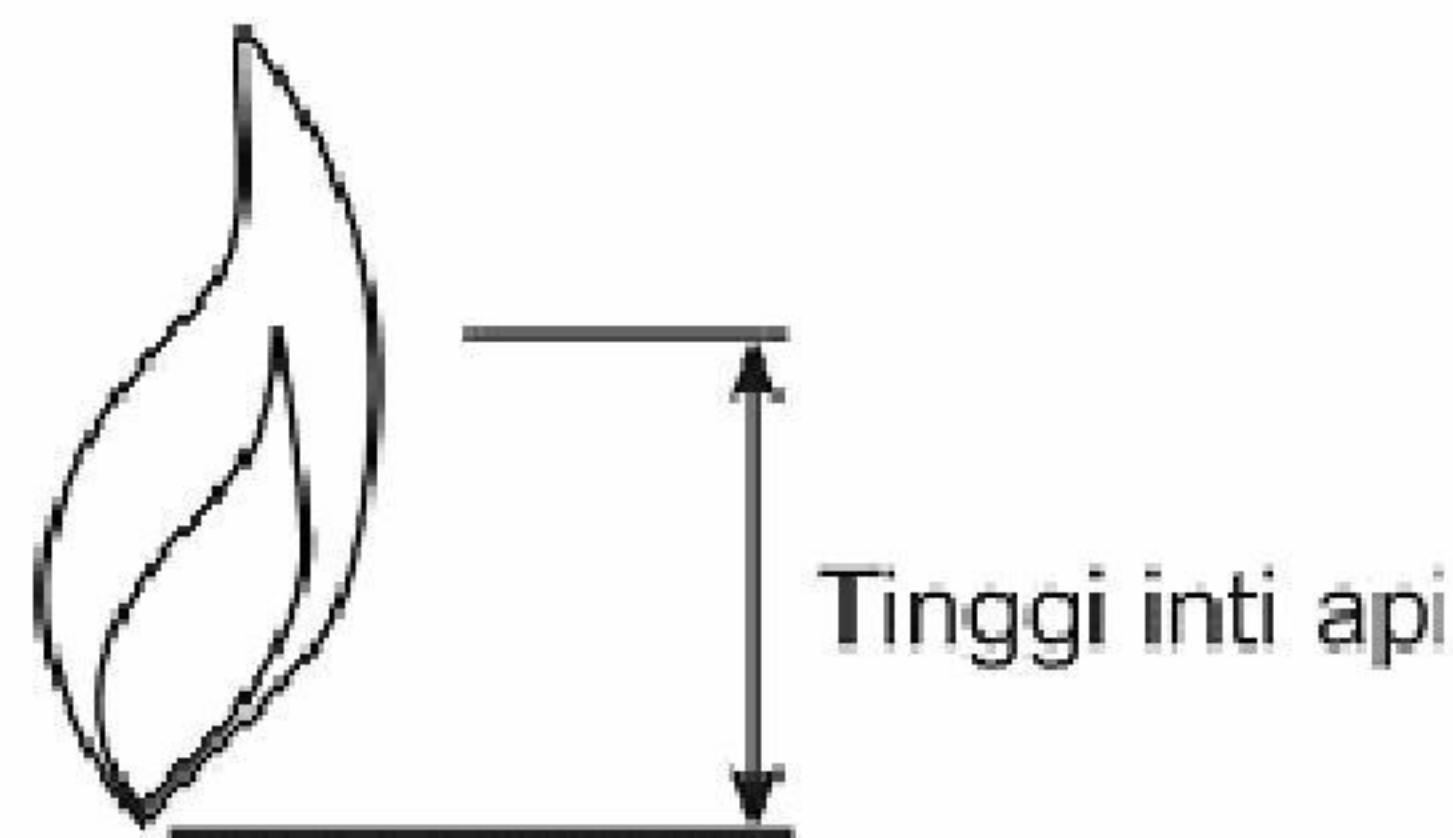
Simbol	Ukuran 1	Ukuran 2	Ukuran 3	Ukuran 4
$\varnothing$ A	200	220	240	260
h	130	140	150	160

**5.1.6** Heat up  $\varnothing$  220 mm flask containing water (filled up until water reaching the top of the flask). Let the water boils for 1 minute. The spill out shall not extinguish the flame.



**5.1.7** Switch on the appliance for 10 minutes. The colour of the flame shall remain blue. The flame shall not change to reddish yellow

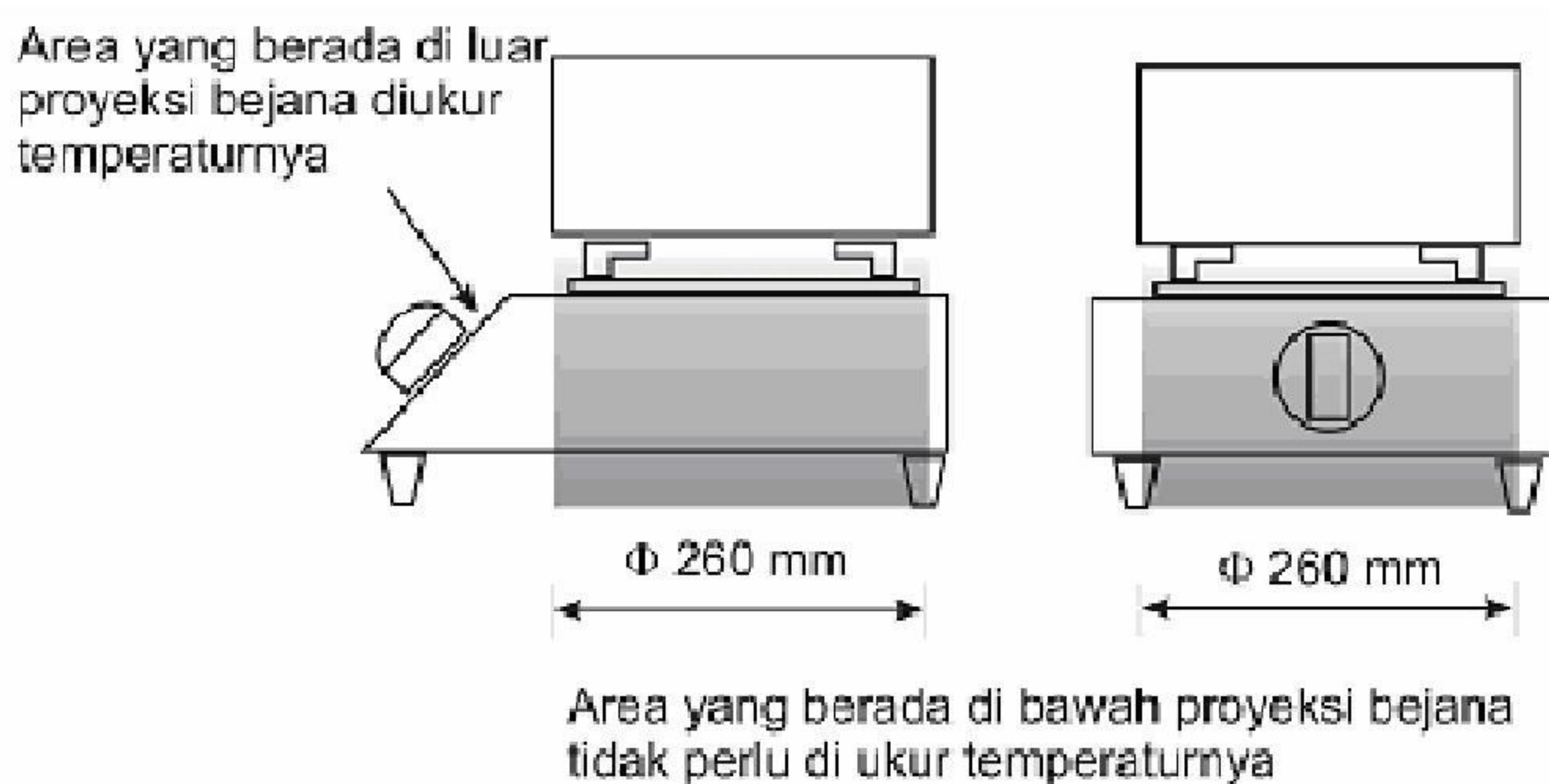
**5.1.8** The flame shall not fly/lifted up from the burner hole more than  $\frac{1}{4}$  of the flame core



**Figure 3 Shape of flame**

## 5.2 Testing for Temperature rise

The temperature for the surface of contact with hand shall not exceed 80 °C. The measurement is done when heating up the flask with Ø 260 mm, height 160 mm, containing water 6,1 kg, switched on for 0,5 hour. The area measured lies outside the area covered by the projection of the flask. See figure 4.



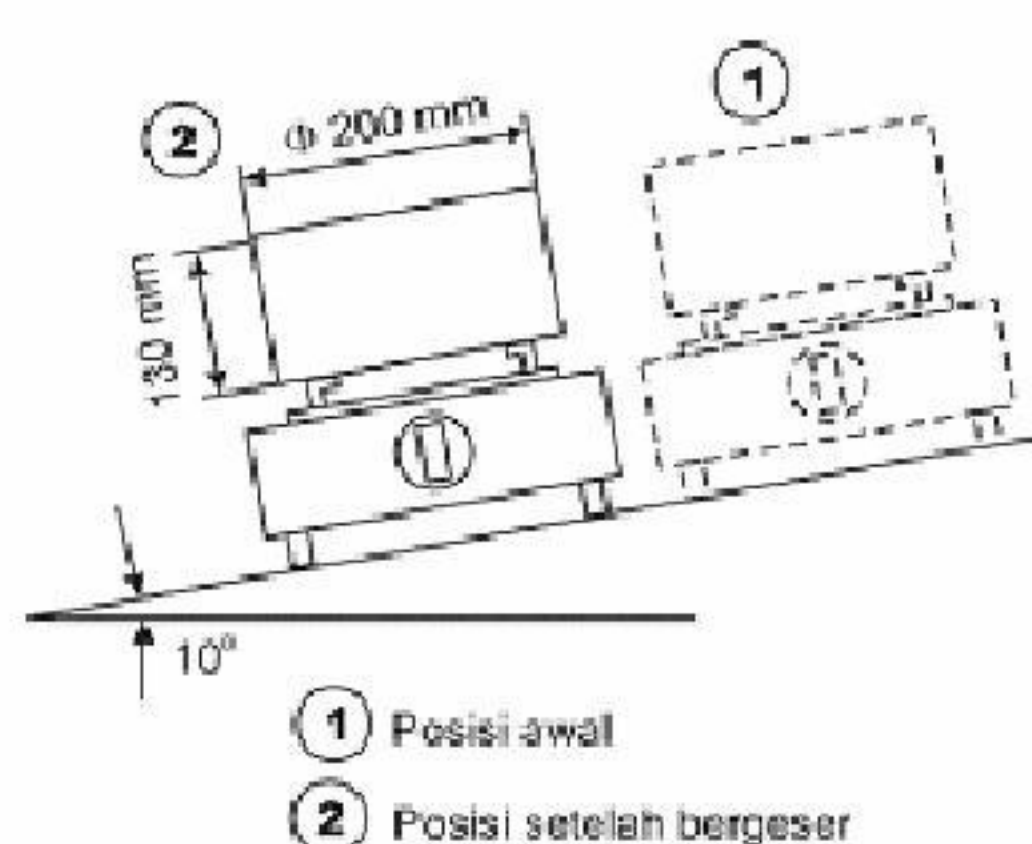
**Figure 4 Testing for temperature rise**



### 5.3 Stability test

**5.3.1** When supporting the flask with  $\varnothing$  200 mm and height 130 mm at the plane having slope  $10^\circ$  from horizontal, both the appliance and the flask shall not be fallen over or shifted.

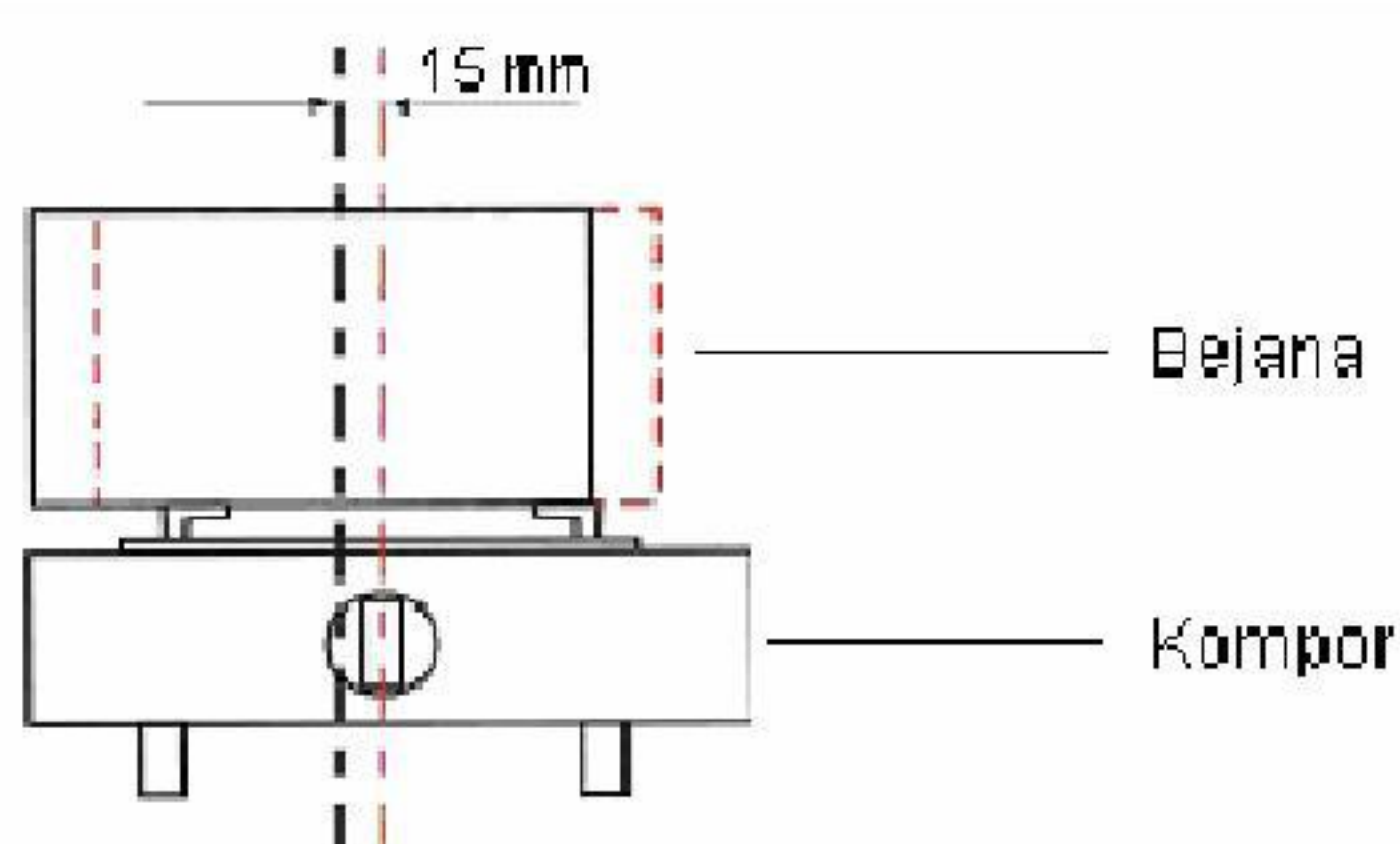
- Put the appliance at the slope plane ( $10^\circ$  from horizontal)
- Put the flask with the specified dimension on the grid of the appliance
- The flask and the appliance shall not shift, fall or tumble



**Figure 5 Appliance stability test**

**5.3.2** When the product supporting a flask with  $\varnothing$  200 mm and height 130mm containing water whose surface is at 10 mm from the tip of the flask was shifted 15 mm from the centre of the grid, the flask and the appliance shall not fall over or tumble

- Put the appliance on a horizontal plane
- Place the flask having dimension as specified above containing water as high as 120 mm from the bottom of the flask
- Shift the position of the flask from the centre of the grid with offset 15 mm outward
- The flask and the appliance shall not fall over or tumble

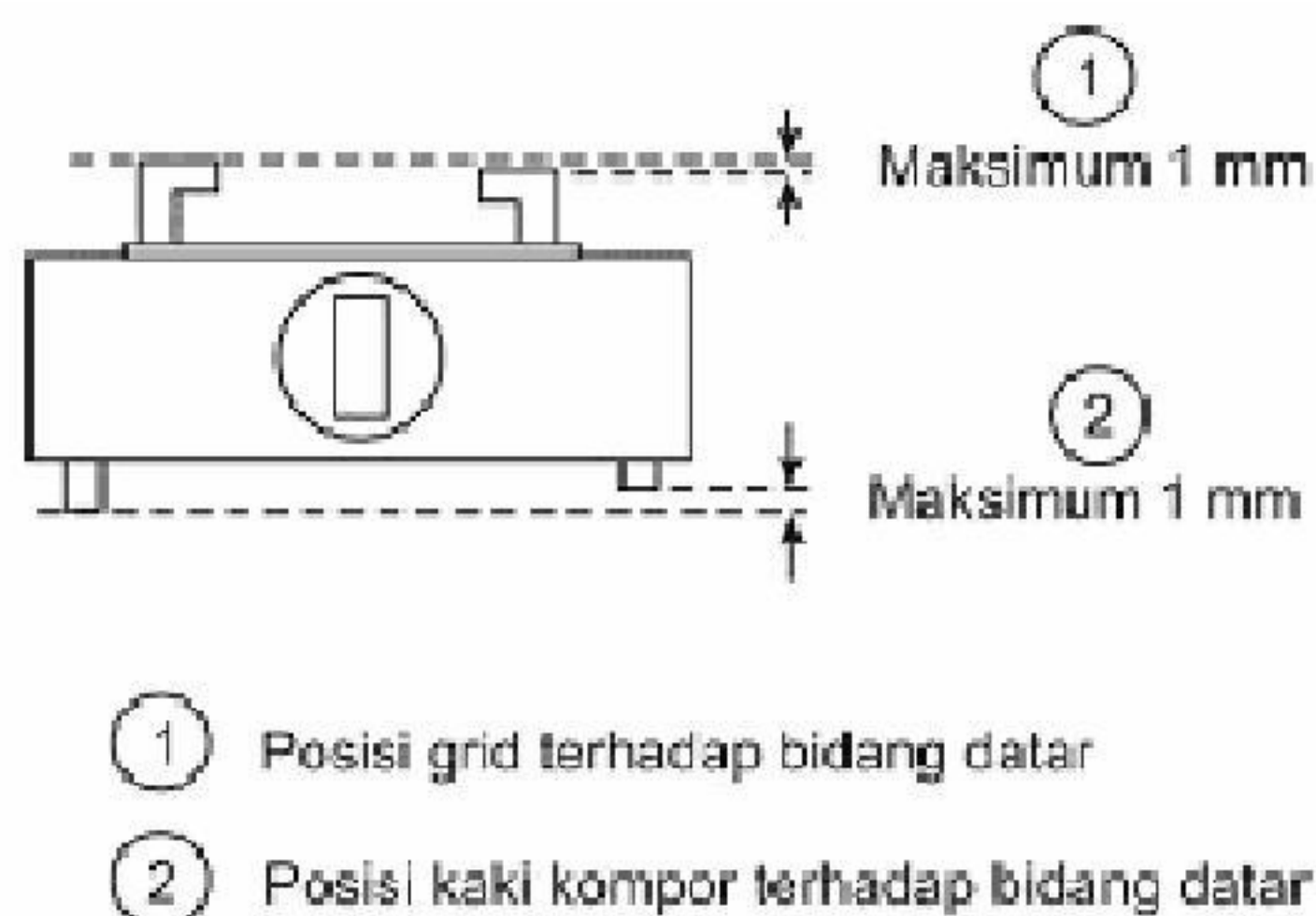


**Figure 6 The position of appliance and the flask**



### 5.3.3 The condition of the appliance without the flask

- a) The position of the grid on the appliance is stable and not easily shifted
- b) The position of the appliance is stable on horizontal plane and strong, not easily deformed when twisted by hand. The tolerance of inclination from horizontal plane is maximum 1 mm



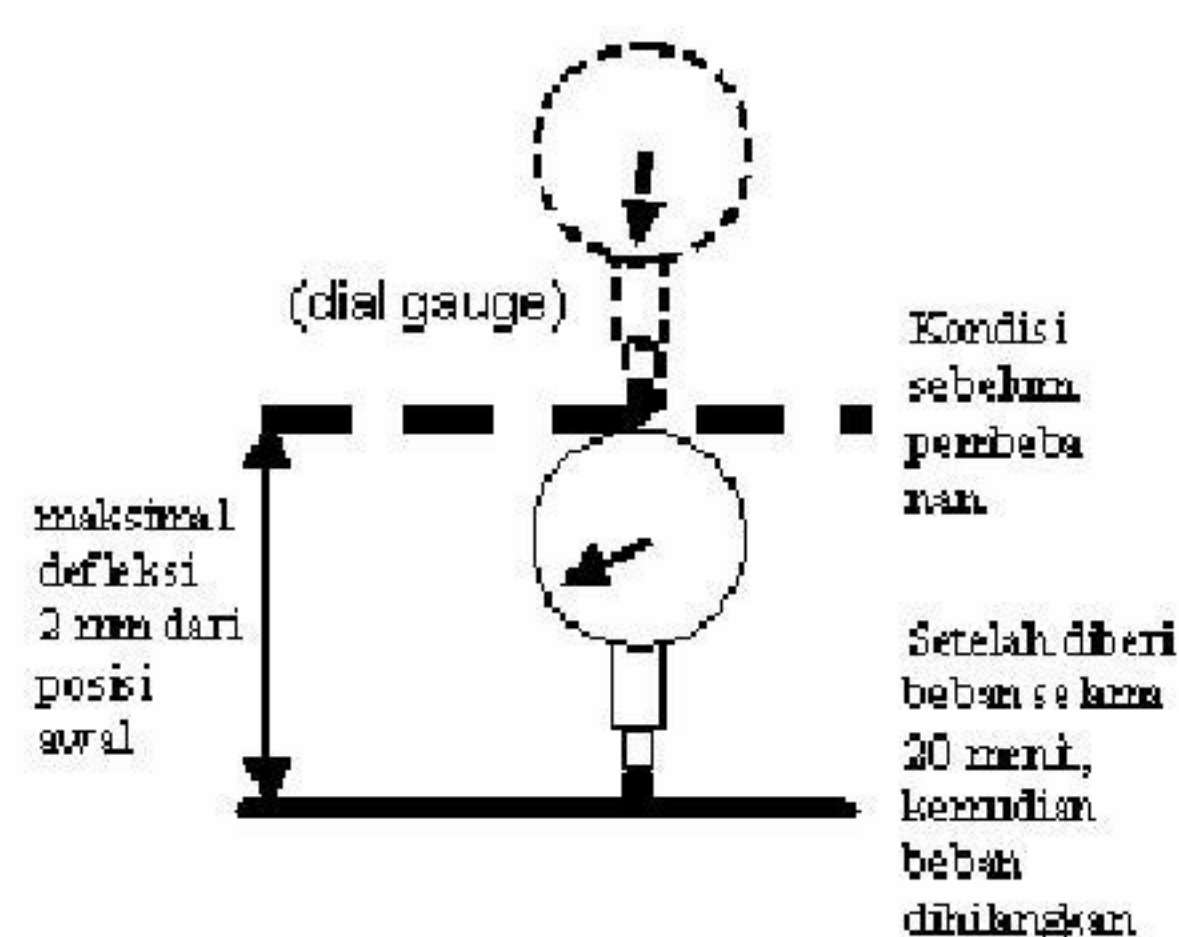
**Figure 7 The position of appliance without the flask**

## 5.4 Strength test

**5.4.1** Grid was loaded with 20 kg weight for 15 minutes, after the load is removed, there shall not be any permanent deflection exceeding 2 mm

- a) Place the appliance on a horizontal plane
- b) Specify 12 points on the top plate of the appliance and measure their position using dial gauge having resolution of 0.05 mm
- c) Load of 20 kg is placed on the appliance with the grid as the supporting point for 15 minutes
- d) After the load is removed, measure again the specified points using dial gauge
- e) At all points on the top plate, the appliance shall not be permanently deflected exceeding 2 mm (see illustration)





**Figure 8 Appliance strength test (dial gauge at the figure is clarified)**

**5.4.2** A container Ø 260 mm containing 6.1 kg water, and burnt for 0.5 hour at maximum flame. After cooled down, no deflection larger than 1 mm is allowed.

- Place the appliance on flat table
- Specify 12 points on the top plate of the appliance and measure their position using dial gauge having resolution of 0.05 mm
- Load of 6.1 kg of water in a container is placed on the appliance, then switch the appliance on for half an hour
- After 30 minutes, the load is removed, and allow it to cool down
- measure again the specified points using dial gauge
- At all points on the top plate, the appliance shall not be permanently deflected exceeding 1 mm

**5.4.3** After going through test 5.4.1 and 5.4.2 :

- The grid shall not be easily removed or inclined when pressed by thumb;
- There is no broken or dented part that may potentially disturb the appliance performance
- The grid stand of the appliance is stable and not easily shifted
- The position of the appliance is stable at horizontal plane and not easily deformed when twisted by hand. The tolerance of inclination from horizontal plane is maximum 1 mm

## 5.5 Visual Test

**5.5.1** The appliance is visually not defective, and the flame remains blue

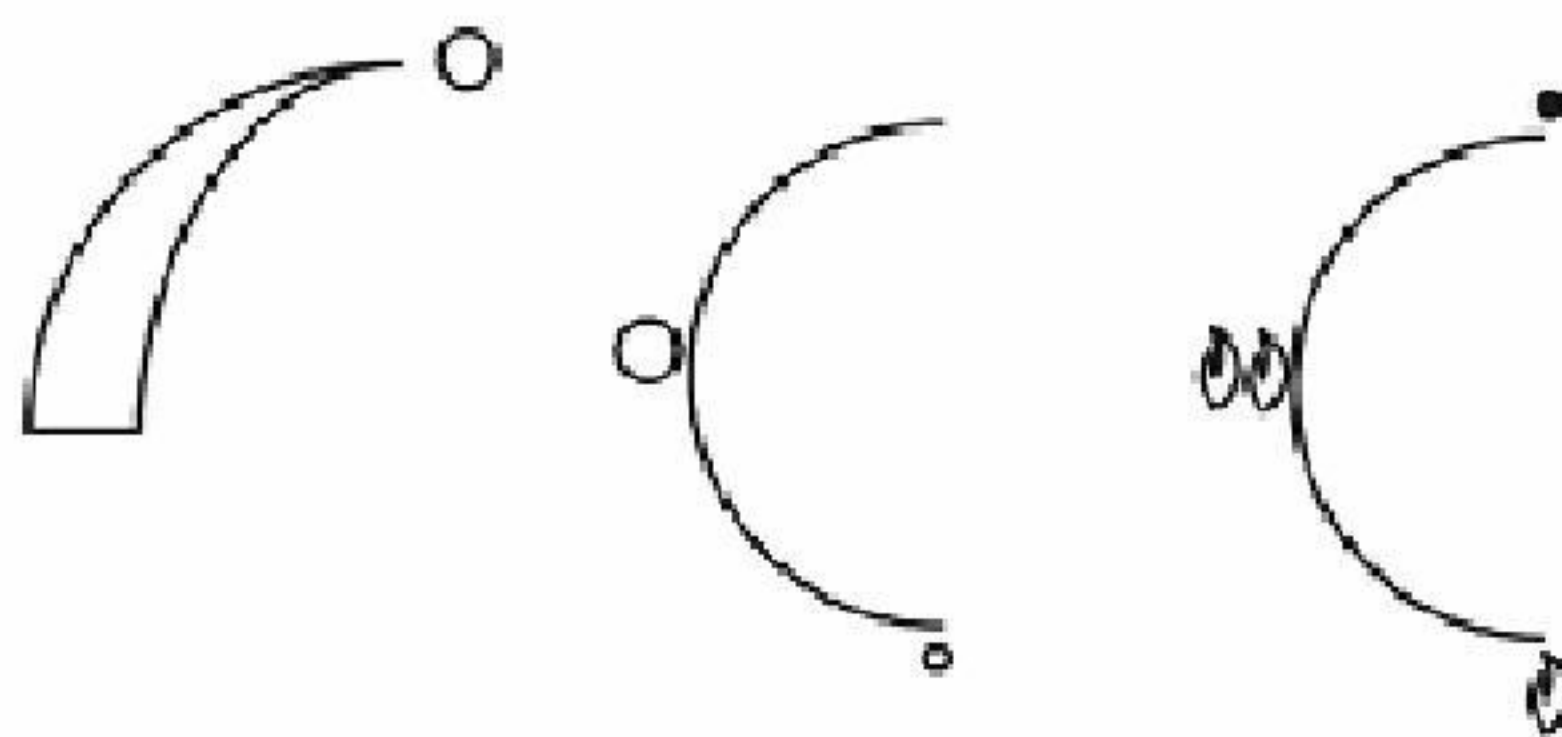
**5.5.2** The material in contact with the flame or exposed to heat shall not be easily burned or peeled off by the heat. It shall not produce sharp odour when first time switched on for five minutes and or after the appliance is switched off.



**5.5.3** Visual examination is done to the components requiring regular maintenance, such as grid, burner, burner stand, or others. The components shall be easily cleaned without having to use special device to disassemble, and shall be easily returned properly without difficulty in re-assembling.

**5.5.4** observation and touching at the angle or sides of the components. There shall not be any dangerous angle or surface that have potential causing injury.

**5.5.5** the turn to open the gas flow shall be anticlockwise. When turning the valve to open gas flow, the ignition shall work at the same time. There is indicator that show the position of maximum and minimum gas valve opening, such as :



**Figure 9 Example of valve opening mark**

**5.5.6** Burner shall not be deformed, changing shape, or others that cause the flame changes to redding yellow, backfire, or flying flame.

## **5.6 Corrosive-proof Test**

A cross cut is applied to both sides of the sample using a knife as shown in the figure, soak the sample half way into 3% salt (NaCl) solution (at temperature between 15 °C and 25 °C) in a container. with depth of approximately 70 mm from the cut for 100 hours. Observe any air bubble at distance of 3 mm from the cut at the outer side, and after removed from the solution, wash with water and dry it. There shall be no rust exceeding 3 mm from the cut at both sides.



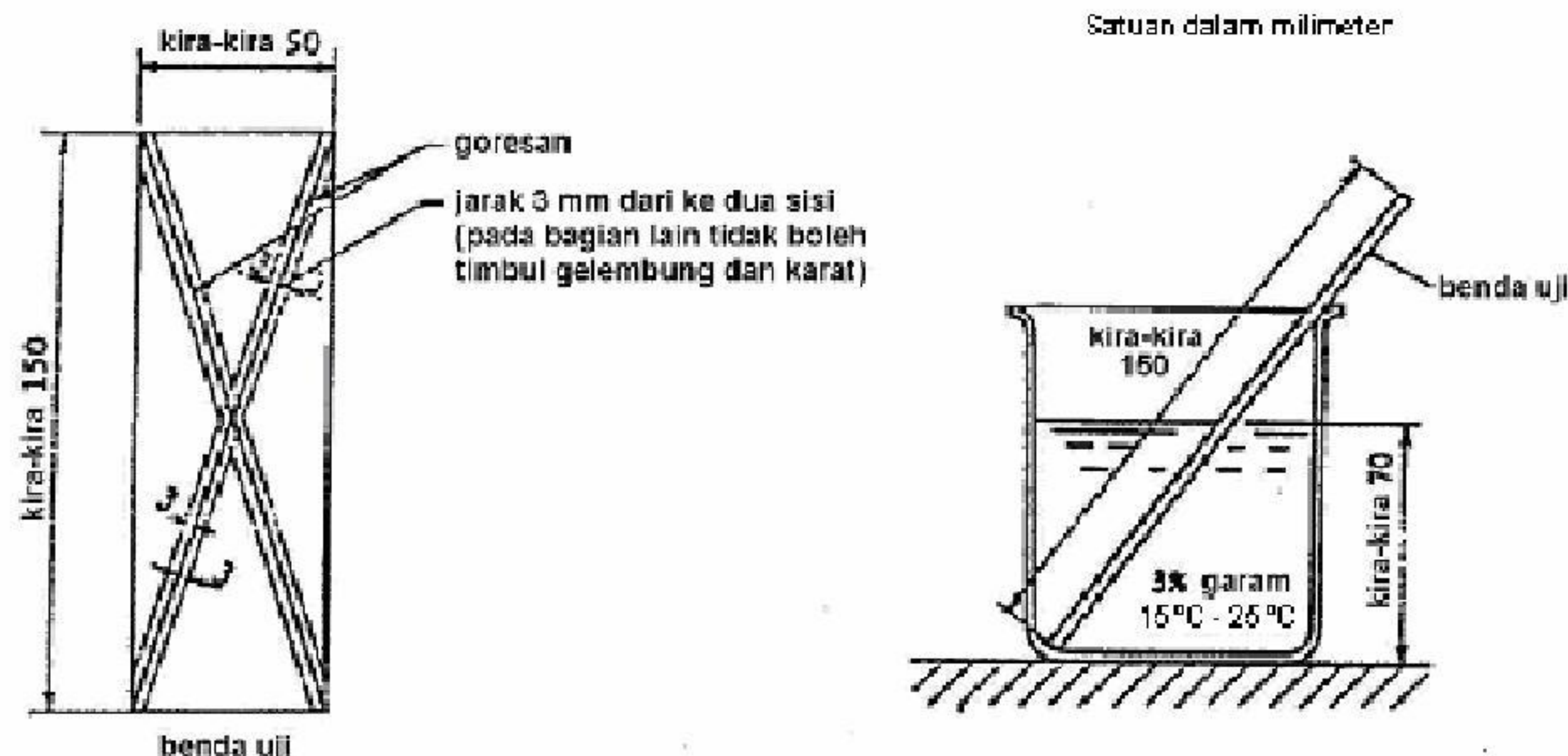


Figure 10 Rust-proof Test

### 5.7 Drop Test

The appliance including its parts is placed inside its package. It is lifted up at 30 cm from horizontal floor and dropped once as shown in figure 11. The floor surface must be hard, not layered with wood, carpet, sponge or similar material that absorbs the collision effect.

After drop test, the appliance shall not be deformed, bolt or joint not loosened, not leaking (comply to 5.8), and the flame remains blue.

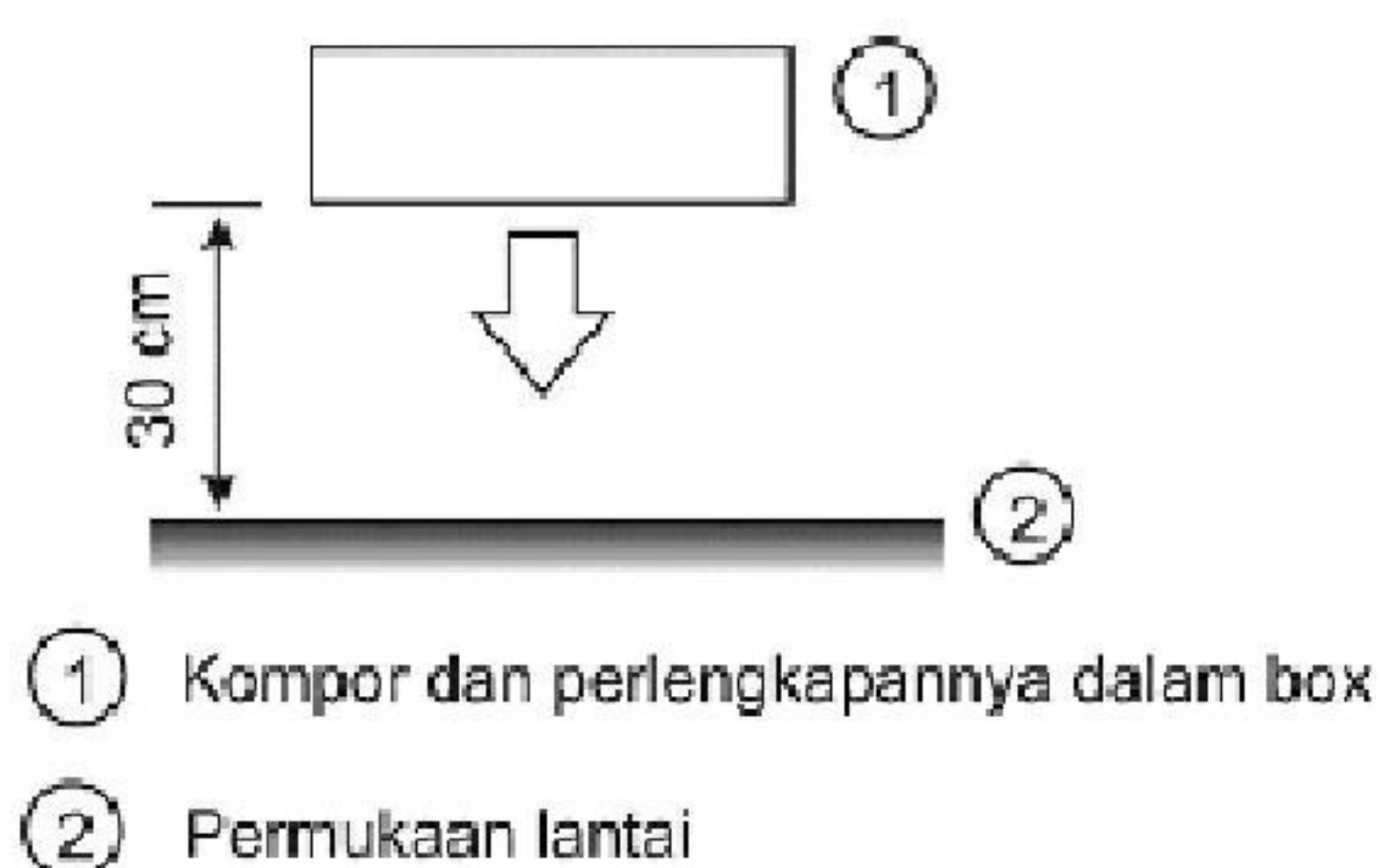


Figure 11 Appliance Drop Test

### 5.8 Leak Test

- Close the gas appliance valve
- Introduce air pressure of  $420 \text{ mm H}_2\text{O} \pm 1 \text{ mm H}_2\text{O}$  to the gas pipe.
- close the air valve



- d) let it stand for 10 minutes
- e) observe U pipe containing water, there shall be no decrease of pressure as much as 10 mm

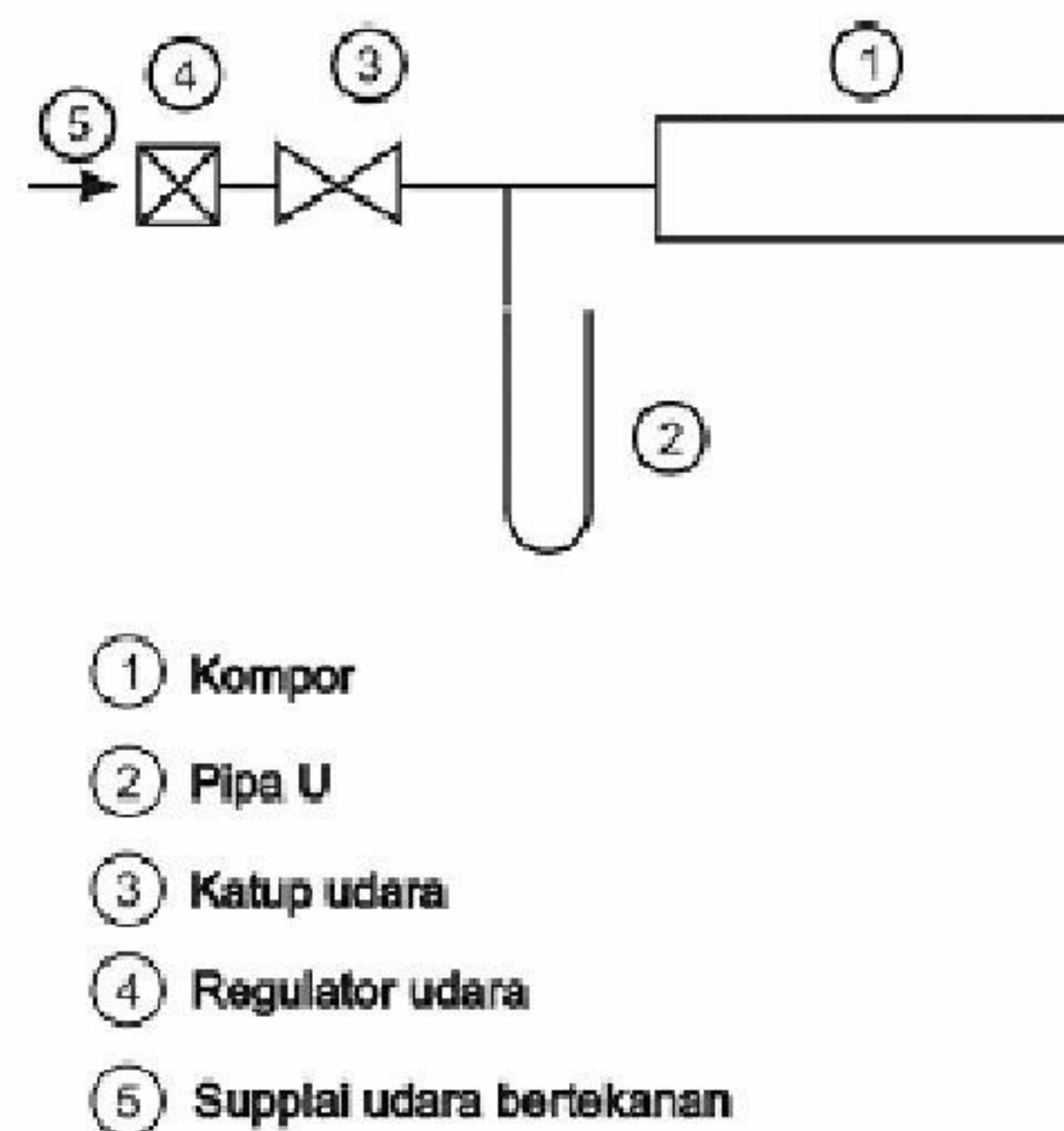


Figure 12 Appliance leak test

### 5.9 Ignition endurance

- a) Ignite the gas valve for 10,000 times
- b) For every 2,000 ignition, do leak test according to item 5.8
- c) Gas valve shall not leak and the ignition shall remain well functioned (sparking)

### 5.10 Gas pressure test

#### a) minimum gas pressure

Apply gas pressure of 200 mm H<sub>2</sub>O to the appliance, burn the appliance for 10 minutes, observe the flame :

- The flame shall be blue
- there is no flying flame
- there is no bounced back flame

#### b) maximum gas pressure

apply gas pressure of mm H<sub>2</sub>O to the appliance, swithc on the applaince for 10 minutes, observe the flame :

- Api harus biru
- Tidak ada api mengangkat
- Tidak ada api membalik



## 6 Labeling and installation manual

### 6.1 Each product unit shall show the following information

- a) product unit production code
- b) The name of the manufacture and or trade mark
- c) The number of Heat Consumption in kW
- d) Product type
- e) SNI number of One-furnace LPG appliances with mechanical ignition system
- f) appliance working pressure

### 6.2 Labeling on the package

- a) Trade mark and or the manufacturer of the product unit
- b) Product type
- c) Warning required for safety and product unity (number of maximum 8, treatment condition, etc)
- d) written in Indonesian language

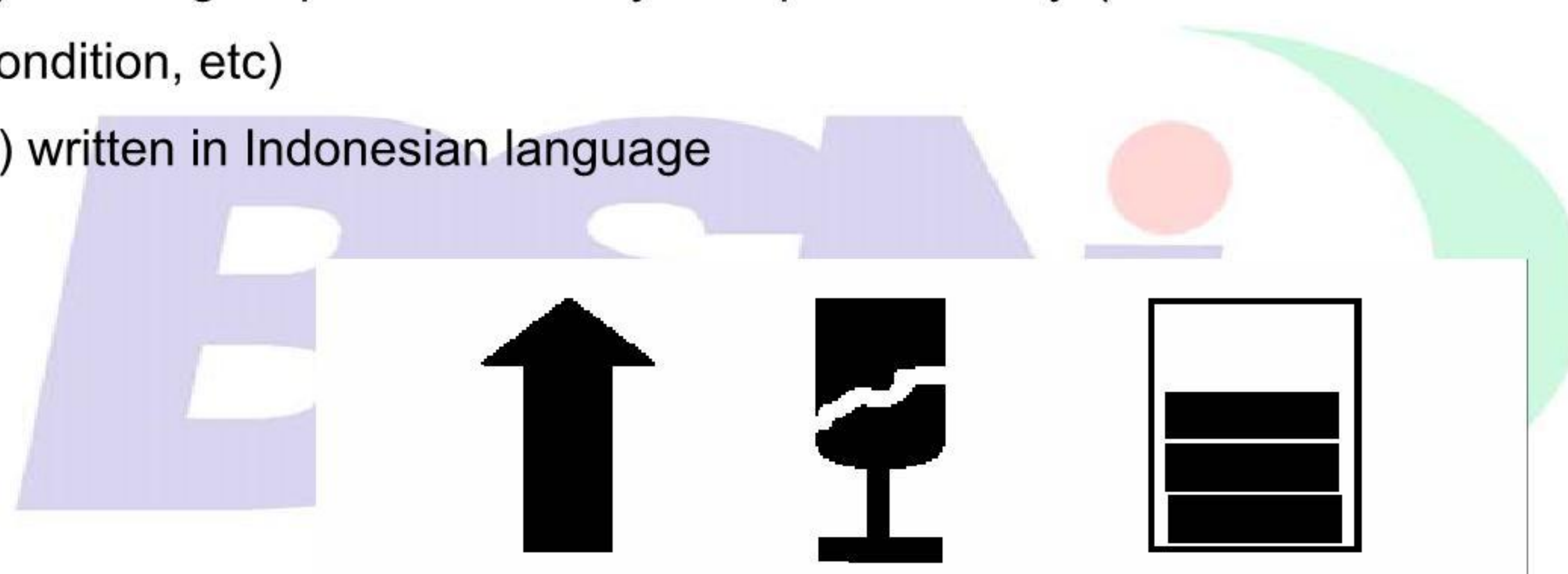


Figure 13 Example of warning on the package

### 6.3 Installation Manual

- a) indication of the name of manufacturer and address as well as telephone number that can be contacted
- b) Guides for Installation and assembly shall be easily understood to avoid mistake in installation
- c) Practical guide for product maintenance
- d) written in Indonesian language
- e) indicating the minimum diameter and maximum mass of container that can be used for the product unit.



## Bibliography

- JIS S 2103-1991, *Gas burning cooking appliances for domestic use.*
- JIS S 2092-1991, *General construction of gas burning appliances for domestic use.*
- JIS S 2093-1991, *Test method of gas burning appliances for domestic use.*
- BS EN 203-1:1993, *Specification for gas heated catering equipment.*
- BS EN 30-1-1:1998, *Domestic cooking appliances burning gas fuel.*











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